EXHIBIT 1

THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

OPTIS WIRELESS TECH., LLC, ET AL., **Plaintiffs,** **v.** **HUAWEI TECHS. CO. LTD., ET AL.,** **Defendants.**	**Civil Action No. 2:17-cv-123-JRG-RSP**

INITIAL EXPERT REPORT OF DR. HARRY V. BIMS, Ph.D. REGARDING INVALIDITY OF U.S. PATENTS NOS. 6,604,216, 8,385,284, AND 8,437,293

Dated: March 26, 2018

Harry Bims

Harry V. Bims, Ph.D.

APPENDIX C – INVALIDITY ANALYSIS OF U.S. PATENT NO. 8,437,293 ("THE '293 PATENT")

9. "in response to" (Claims 1, 12, and 20)

36. I previously provided a declaration in support of Huawei's claim construction of this term. *See* Declaration of Harry Bims Ph.D. Regarding Claim Construction of U.S. Patent Nos. 6,604,216, 8,285,284, and 8,437,293, Dkt. No. 101-1 (Nov. 3, 2017). I understand that the Court has since determined that "in response to" should be given its plain and ordinary meaning. CC Order at 73. For the purposes of my opinions below, I have been asked to apply the Court's construction of "in response to."

IV. THE PRIOR ART TO THE '293 PATENT

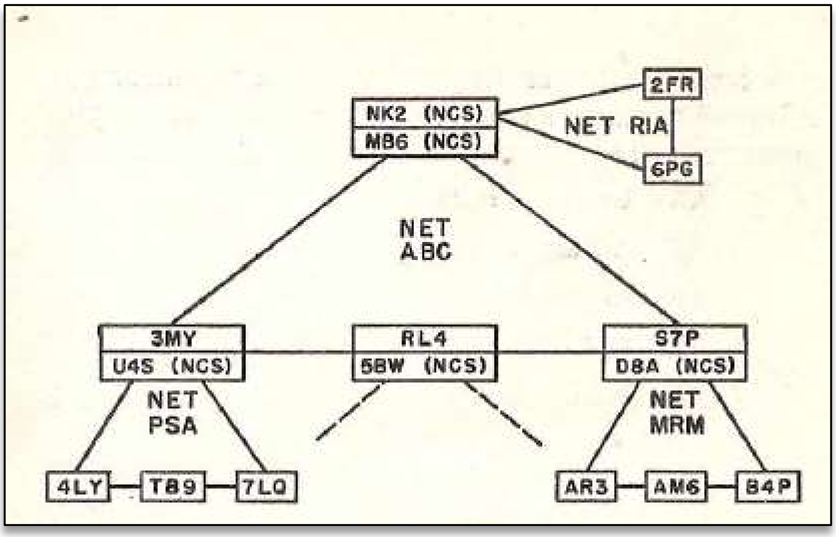
A. Scheduling Resources Is A Fundamental Practice Used in Telecommunications Networks

37. In my opinion, the '293 Patent is directed to the abstract idea of "scheduling of resources in a telecommunications system." '293 Patent, 1:17-19. In particular, the '293 Patent claims are directed to a process one network location (i.e., a mobile terminal) communicates information about the amount and type of data it desires to send to another network location (i.e., a base station) and the second network location determines whether or not to allocate resources to allow that transmission to occur. *See*, e.g. '293 Patent, cls. 1, 12, 19. Scheduling or allocating resources has been a fundamental practice in telecommunications networks since they have existed. This is due to the fact that telecommunications networks share a common attribute: they all transmit information (e.g., voice calls, data traffic, text-based messages, etc.) through a transmission medium that is limited in the amount of information it can transmit. Therefore, when utilizing these resources, it is necessary to allocate or schedule them for transmission in order to maximize the utilization of the medium by avoiding any overlapping transmissions from competing network devices, since this causes the device communications to fail.

1. Historical Examples of Scheduling Resources in a Telecommunications Network

38. A widely known example of scheduling resources is in early telephone networks, where a human operator performed a scheduling function by using a switchboard to allocate copper wires that are part of the telephone network for use during a "call" between multiple parties. Once allocated, other human operators could not use the allocated copper wires for other "calls" until they were deallocated through the switchboard. As long distance telephone networks advanced in the middle of the 20th century, human operators have been replaced by networking equipment that allocates network connections for communication sessions between parties. For example, Western Electric commercialized the "No. 5 Electronic Switching System" (the "5ESS") product, developed by Bell Laboratories, Inc., in the early 1980s. Each 5ESS routed thousands of telephone calls simultaneously over common network "trunk" lines as part of the nationwide long-distance telephone network. To do this efficiently, the 5ESS assigned telephone calls to time slots on these trunk line using a scheduler. During periods of unusually high call volume, the 5ESS was not always able to schedule network time slots to a calling party. For example, when a long-distance telephone call was requested in this scenario where all network connections have been allocated, a calling party would hear a "busy" signal, indicating that all network connections have been allocated by the network scheduler.

39. Another example of the approaches early telecommunications networks took to scheduling network resources can be seen in early wireless radio networks. For example, the U.S. War Department provided a "Radio Operator's Manual" for the Army Ground Forces in June 1945. In this manual, the War Department established procedures for creating a "Radio Net" which was a network of radio stations deployed in an operational theater. An example of the radio net is reproduced below:



HWPO_00174564-00174636 at 4577. Part of the establishment of this radio net also involved protocols that were used before transmitting messages to ensure that network resources could be allocated for the called station to receive the message. The procedure first required the sending station to transmit a message summarizing the messages it wished to send. This is shown in the excerpt below:

16. MESSAGE HANDLING. **a.** A station having message traffic for another calls and reports what he has to transmit:

Example

(1) One message:

3MY V MB6 QMM K

or

3MY V MB6 K

When no misunderstanding will result, it is common practice to omit the operating signal QMM when calling to send one message.

(2) Two messages:
3MY V MB6 QMM 2 K
(3) One urgent message:
3MY V MB6 O K
(4) One urgent, two routine:
3MY V MB6 QMM 1 O 2 R K

Id. at 4598-4599. Referring to the excerpt above, the Radio Operators Field Manual showed that prior to transmitting radio messages, the operator communicated using procedural signals indicating the number of messages intended to be transmitted and the priority of the messages themselves. *Id.* The Radio Operators Field Manual provided a hierarchy of message priority, as indicated in the Section below:

b. Message precedence is indicated by prosigns, which, listed in order of precedence, are as follows:

Precedence	*Prosign*
Urgent (Highest)	O
Operational Priority	OP
Priority	P
Routine	None—(R)*
Deferred (Lowest)	D*

*Routine messages bear no precedence indicator when filed, and are not identified by any prosign during transmission. They are identified by the prosign R when reporting precedence of traffic to be transmitted. Deferred precedence is rarely applied to tactical messages, and is not used within the division.

Id. at 4593.

40. In response, the recipient communicated their "readiness to receive messages" which included the ability to selectively accept messages based on the message priority:

b. The station called indicates his readiness to receive messages.

Examples

(1) Transmit all messages:
MB6 V 3MY K

(2) Transmit only urgent messages:
MB6 V 3MY QOM O K

(3) Not ready to take messages:
MB6 V 3MY $\overline{\text{AS}}$ (A few seconds' wait) K

or (4) Not ready to take messages:
MB6 V 3MY $\overline{\text{AS}}$ (More than a few seconds' wait) $\overline{\text{AR}}$

Id. at 4599.

41. In addition, the Radio Operator's manual describes a "Controlled Method" for radio transmissions where "under conditions of controlled communications, a subordinate station must obtain permission from the control station to communicate with a subordinate station." *Id.* at 4617. To do this, the subordinate station must request permission from the control station, which is responsible for authorizing subordinate stations to communicate messages on the network. *Id.* The control station can also tell a subordinate station requesting transmission to wait, or re-direct the subordinate station to route its messages through the control station. *Id.* In this way, the control station is able to schedule subordinate station transmissions. *Id.*

2. Scheduling Resources in the Modern Telecommunications Network

42. This fundamental practice of scheduling resources in a telecommunications network has also been widely applied to mobile wireless telecommunications networks. In a mobile wireless telecommunications system such as an LTE system, the scheduling of resources can be done through similar interactions to the one outlined above, but due to the scale of modern mobile wireless networks, it is no longer done through human operators. Instead, each base station controls the allocation of physical resources (defined by sets of frequencies and time intervals) that are used for the uplink transmission of data from mobile devices within its coverage area. *See* '293

Patent, 1:58-62. Multiple physical resources can be allocated by the base station to any particular mobile device, such as a frequency set allocated for the duration of a time interval. *See Id.*, 1:47-56. Due to the independent mobility of mobile devices relative to base stations, a base station may experience a highly variable number of mobile devices within its coverage area, since the coverage area of any given base station is a small subset of the geographic area that can be covered by any given mobile device. *Id.* Also, the maximum number of such devices within the coverage area of a base station is uncontrolled by the base station (because of the independent nature of the mobility of mobile devices), and is therefore not bounded by any predetermined maximum threshold that could be used to configure the base station. *Id.*

43. As a result, the base station must be designed to handle a potentially unbounded number of mobile devices that simultaneously require uplink resources for the transmission of data to the base station within any given time interval. *See Id.*, 1:52-55. Further, even if the base station could predict the maximum number of such mobile devices, the base station is constrained by the number of frequency sets that it is allowed to allocate to the mobile devices within its coverage area. *See Id.*, 1:47-56. Thus, there are typically far more devices within the coverage area of a base station than carrier frequency sets available for uplink transmissions.

44. In the absence of a scheduling scheme that determines how frequency sets are allocated to mobile devices, there is the potential that more than one mobile devices will attempt to use overlapping frequency sets for transmission of data during the same time period. When this occurs, simultaneous transmissions from the mobile devices will interfere with each other when the base station attempts to receive them. This is called a "collision," and results in the failure of one or all of the transmissions.

45. One scheduling scheme that can address this problem is referred to as "contention-based" access. In a contention-based access, the mobile terminals contend with one

another for opportunities to transmit on uplink resources, since an uplink scheduler does not allocate those resources to them. One way that mobile devices minimize this contention is by independently randomizing the resources they individually choose for a transmission. Once a mobile device begins transmission, the other mobile devices defer using its associated uplink resources. *See Lohr*, 3:46-51.

46. By independently randomizing the selection of uplink resources, the mobile devices distribute their transmissions on uplink resources more evenly than if they all followed a deterministic algorithm that caused them to select the same uplink resources at the same time. Random selection reduces the probability of a collision, since the wireless network can be designed such that the probability of a "collision" can be reduced below a predetermined threshold, using mathematical models that characterize the profile of mobile device behavior with respect to both the timing and duration of access to uplink resources. *See Id.*, 5:33-50. Generally, however, this class of methods results in a certain number of unused resources, even when the number of mobile devices requesting resources is greater than the availability of uplink resources. Resources will always go unused in a contention-based system because there will always be a non-zero probability that a given resource is not chosen by random selection by any of the mobile devices. In addition, there will always be a non-zero probability that two or more devices select the same uplink resource. However, this probability is minimized below an acceptable level. *See Id.*

47. Another scheduling scheme that can address this problem involves a base station that makes scheduling decisions without input from the mobile terminals as to when they need access to uplink resources, the duration of that need, the priority of that need, or the bandwidth of that need. For example, if there are N resources available to a base station for allocation to mobile devices for uplink data transmission, the base station may allocate them to the first N mobile devices that enter the coverage area, regardless of the amount or priority of data in

their transmit buffers. This is sometimes referred to as a "buffer-blind" approach. R2-060829 at 1. Although these mobile devices are guaranteed resources for uplink data transmission, the subsequent mobile devices that enter the coverage area will not be able to transmit uplink data until an earlier device relinquishes its fixed allocation by leaving the coverage area. *Id.* As a result, this could lead to inefficient "utilization of allocated radio resources" because mobile terminals will be assigned resources that they may not need. *Id.*

48. Another scheduling scheme that can address this problem comprises a process in which mobile terminals update the uplink scheduler with information concerning the status of their internal data buffers. One sub-class of this technique is a "1-step" procedure in which mobile terminals transmit their buffer information to the base station in one step, including potentially when there is no data to transmit. R2-062164 § 2.1.1.1. Another sub-class of this technique is a "2-step" procedure, in which any mobile terminal transmits a request to the base station in the first step, for an opportunity to send additional information concerning the status of their internal data buffers in the second step. *Id.* After mobile terminals exchange information regarding their uplink resource needs with the uplink scheduler, the scheduler considers this information when it flexibly allocates uplink resources to the mobile devices. R2-060829 at 1. Mobile terminals then transmit their data once the negotiation is completed and resources are allocated. Any mobile terminal, on an as needed basis, initiates the start of the 2-step procedure.

49. One aspect of this class of access technologies involves mobile devices that communicate the priority level of their uplink data with the uplink scheduler before data is transmitted. R2-060829 § 3.2.2. Another aspect of this class of access technologies involves mobile devices that communicate the amount of pending data in the mobile terminal to the uplink scheduler, before data is transmitted. *Id.* § 3.2.1. These aspects are sometimes summarized as a "buffer-aware approach," since they both involve communicating attributes of the data contents in a

buffer the mobile terminal uses to temporarily store pending data to be transmitted to the base station. *Id.* § 1. Not only does the scheduling algorithm in the base station use this class of technologies to avoid collisions, there is the additional benefit that all of the uplink frequency sets can be more efficiently utilized when the number of mobile devices requesting uplink data transmission exceeds the number of mobile devices the base station can handle given the available resources. *Id.*

B. Utilizing Scheduling Request Triggering Events Was a Conventional and Well-Known Technique in the Modern Telecommunications Network

50. The asserted claims of the '293 Patent are directed to improving upon the already established 2-step procedure discussed above. I previously discussed this improvement in Section II.B.2. It is further my opinion, that the alleged improvement—using scheduling request triggering events—was a convention and well-known technique in mobile wireless telecommunications networks.

51. When using a flexible approach, such as the 2-step procedure discussed above and claimed in the '293 Patent, it is necessary to predefine a set of conditions or events that cause the mobile device to initiate the first step in the procedure discussed above. These are generally referred to as triggering events, and by the priority date of the '293 Patent were well-known in the art.

52. For example, during the 3GPP TSG-RAN WG2 meeting #46-Bis held in Beijing, China on April 4-8, 2005, Qualcomm presented a paper it previously submitted to the 3GPP through the FTP and email distribution list entitled, *R2-050956: SI Transmission Triggering Schemes*. *R2-050956*; *see also* Section IV.C.7.d, *infra*. In this paper, Qualcomm publicly discussed the use of various types of "Triggering Schemes" because "[i]t is critical for the Scheduling Information to be sent to the UTRAN whenever it might provide valuable information to the scheduler." *Id.* at § 1.